

Amendments to the Specification:

Page 5, line 16

Although the conventional method 50 functions, one of ordinary skill in the art will readily recognize that the performance of the conventional MRAM 1 may degrade due to processing occurring after formation of the conventional MTJ stack 30. The processing temperature in step 62 or the conventional bit line 12, as well as other following on processes in step 64, can be a few hundred degrees Celsius. At such a temperature, the oxygen in the conventional dielectric layer 40 surrounding the conventional MTJ stack 30 can diffuse into the conventional MTJ stack 30. This oxygen can oxidize the magnetic materials used in the conventional free layer 38 and the conventional pinned layer 34. The magnetic properties of the conventional magnetic layers 34 and 38, such as the effective thicknesses and the coercivities, change depending on the degree of oxidation. Consequently, the conventional magnetic layers 34 and 38 may not behave as expected or desired. Furthermore, the oxygen can diffuse along the insulator 36 that acts as a tunneling barrier between the pinned layer 34 and the free layer ~~36~~38. The oxygen can further oxidize the interfaces between the insulator 36 and the magnetic layers 34 and 38. As a result, the resistance of the conventional MTJ stack 30 increases and the variation in resistance with the direction of the magnetic vector of the free layer decreases (the Magnetoresistance), causing a deterioration of signal of the MRAM device. Thus, performance of the conventional MTJ stack 30 may be compromised.

Page 18, line 16

The bottom surface of the seed/AFM layer 102' is connected to the conductive layer 309, which is connected to the drain 304 of the transistor 313 through the stud 308. The top of the free layer 108' is connect to the bit line 312, which preferably carries a write current during writing and provides a read current to the MTJ stack 101' during reading. The word line 310 is used for writing and is preferably oriented orthogonal to the bit line 312. Because the magnetic element 100' includes passivation layer 110A' and 110B' and because the top and bottom surfaces of the MTJ stack 101' are enclosed by metallic conductors, oxygen diffusion into the MTJ stack 101' from the surrounding structures is significantly reduced. Performance degradation of the MTJ stack ~~101'~~121' related to undesired oxidation of the layers 102', 104', 106', and 108' of the MTJ stack ~~101'~~121' during subsequent processing of the magnetic memory 300 can be substantially prevented. Performance of the magnetic memory 300 is, therefore, improved.

Page 19, line 5

Figure 5 depicts an alternate embodiment a magnetic memory 300' utilizing a magnetic element 140 in accordance with present invention. The magnetic memory 300' is substantially the same as the magnetic memory 300 depicted in Figure 4. However, as discussed above, it is possible to use another magnetic element, such as the magnetic element 120 or 140, in the magnetic memory 300. Thus, the magnetic memory 300' utilizes the magnetic element 140' and is fabricated using the substrate 302'. The magnetic element 140' is substantially the same as the magnetic element 140 depicted in Figure 2C. The magnetic memory 300' is thus substantially the same as the magnetic memory 300. Consequently, the magnetic element 140 include a stack

141' having layers 142', 144', 1406', and 148' and passivation layers 150A' and 150B', a word line 310', a bit line 312', a ground line 307', a transistor 313', a conductive stud 308', and a conductive layer 309'. The transistor 313 is preferably a MOS transistor including a source 303', a drain 304', and a gate 306'. The source 303' is coupled to the ground line 307' through another plug 305'. However, the bit line 312' has an uneven surface due to the shape of the passivation layer ~~130A'-150A'~~ 130B'-150B'. The magnetic memory 300' thus shares the benefits of the magnetic memory 300. In addition, for the reasons described above with respect to the magnetic element 140, the magnetic element 140' has additional protection against oxygen diffusion even in the presence of non-vertical sidewalls, misalignments, or other issues. Consequently, the performance of the magnetic memory 300' is even less likely to degrade due to back end processing of the magnetic memory 300'.

Page 19, line 20

Figure 6 depicts a second embodiment of a magnetic memory 350 utilizing a magnetic element 100'' in accordance with present invention. The magnetic memory 350 is preferably an MRAM provided on a substrate 352, such as a silicon wafer. The magnetic element 100'' depicted in Figure 4 is the same as magnetic element 100 shown in Figure 2A. However, nothing prevents the use of the magnetic elements 120 and 140 depicted in Figures 2B and 2C, respectively. The magnetic element 100'' includes an stack 121' having the layers 102'', 104'', 106'', and 108'' and passivation layers 110A'' and 110B'' that are preferably the same as depicted in Figure 2A. Referring back to Figure 6, the magnetic memory 350 also includes a word line 382, a bit line 380, a ground line 377, a transistor 381, and a conductive stud 378. The

transistor 381 is preferably a MOS transistor including a source 373, a drain 374, and a gate 376. The source 373 is coupled to the ground line 377 through another plug 375. The bit line 380 carries a write current during writing and provides a read current during reading. The word line 382 carries a current during writing and, in contrast to the magnetic memory 300, is located below the magnetic element 100'.